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ABSTRACT

Many international standards have been developed to aid information transfer and feedback, but they must be updated and promoted. International Organization for Standards (ISO) technical committees dealing with terminology, documentation, and information processing have several programs designed to meet this need. Catalogs, indexes, and specialized centers provide some sources of information and guidance in the application of standards, and way are suggesed for furthering the application of standards in systems interconnection. (Author/CH)

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APPLICATION OF STANDARDS IN SYSTEMS INTERCONNECTION

A paper prepared by ISO for the International Symposium on Information Systems : Connection and Compatibility.

Varna, Bulgaria, 30 September – 3 October 1974

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

1, rue de Varembé, 1211 Geneva 20

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Some abbreviations used in standardization [26] and in this paper

AFNOR	Association Française de Normalisation
AGRIS	International Information System for the Agricultural Sciences and Technology (FAO)
ANSI	American National Standards Institute
BSI	British Standards Institution
CCIR	International Radio Consultative Committee (UIT)
CCITT	International Telegraph and Telephone Consultative Committee (UIT)
CIINTE	Centralny Instytut Informacji naukowo technicznej i ekonomicznej. (Central Institute for Technical and Economic Information, Warsaw)
DIS	Draft International Standard
DNA	Deutscher Normenausschuss
DP	Draft proposal
DS	Dansk Standardiseringsraad
EDP	Electronic data processing
FAO	Food and Agriculture Organization of the United Nations
IAEA	International Atomic Energy Agency
IEC	International Electrotechnical Commission
INFOTERM	International Information Centre for Terminology
INIS	International nuclear information system
ISBN	International Standard Book Number
ISDS	International Serials Data System
ISO	International Organization for Standardization
ISODOC	International Centre for information on standards for documentation & information processing (subject to confirmation).
ISO/R	ISO Recommendation
ISRN	International Standard Record Number
ISSN	International Standard Serial Number
ITU	International Telecommunication Union
KWIC	Key work in context
NBS	United States Department of Commerce, National Bureau of Standards
NNI	Nederlands Normalisatie-Instituut
ON	Österreichisches Normungsinstitut
RPI	Rows per inch
RPmm	Rows per millimetre
SABS	South African Bureau of Standards
SC	Sub-committee
SCC	Standards Council of Canada
SIS	Sveriges Standardiseringskommission
SNV	Association Suisse de Normalisation
TC	Technical committee
UN	United Nations
Unesco	United Nations Educational, Scientific & Cultural Organization
UNI	Ente Nazionale Italiano di Unificazione
UNIDO	United Nations Industrial Development Organization
UNISIST	World science information system
WG	Working group
WHO	World Health Organization

APPLICATION OF STANDARDS IN SYSTEMS INTERCONNECTION

ABSTRACT

The first step towards successful application of standards is to recognize the need. Then standards must be developed and promoted. Information and advice must be available to the user. Co-operation with the user provides "feed-back" leading to an improved system of standards. Economic as well as technical reasons dictate the need for International Standards in systems interconnection.

Many International Standards have been developed to aid information transfer but others are needed. ISO technical committees dealing with terminology, documentation and information processing have extensive programmes designed to meet this need.

Some sources of information and guidance in the application of standards exist already and others are planned. They include catalogues and indexes, specialized centres and the developing ISO Information Network.

Ways are suggested for furthering the application of standards in systems interconnection including a special follow-up meeting of international organizations operating information systems.

1. THE NEED FOR STANDARDS

A primary function of the standards which have been established nationally during the last 50 years and by ISO internationally during the last 30 years has been to provide a means of communication. In his review of "The aims of standardization" Sanders [1] states ".... there is now a much wider recognition of the value of standards as a means of communicating ideas and technical data, in creating order out of disorder and offering simplification in place of complexity." Of course standards have a wider range of functions to fulfil. They promote overall economy of human effort, interchangeability of parts, safety; they protect consumer and environmental interests and help to eliminate barriers to trade. But in all these functions the communication aspect is present, so, ideally, standards should be brief and concentrated but easily understandable. To take account of technological advance and social changes, standards should be designed for regular updating. To summarize, standards provide a means of ensuring a uniformly high level of practice in almost every field of human affairs.

The recognition of this led to an organized approach to national standardization in the early years of this century. The growth of international trade, technical advances in methods of communication and the consequent need to communicate between nations and across language barriers led naturally to a demand for international standards. Sanders cites international agreement on standards of time and navigation as early examples, in particular the acceptance of the Greenwich meridian as the zero for longitude in 1884. In fact, the development of international standardization closely followed and took place in parallel with national standardization. The history has been extensively reviewed by Verman [2], who lists a number of international organizations having active standardization programmes.

This trend towards international standardization has become more marked in recent years. An additional factor has been the relatively high cost involved in developing standards on a national rather than on an international basis. At the 8th General Assembly of ISO, the Director of the Norwegian Standards Institute [3] estimated (in 1970) a cost of 1 000 dollars a page to develop a new Norwegian standard compared with 300 dollars a page to adapt an ISO Standard to Norwegian requirements. Sometimes conversion could be achieved for as little as 50 to 100 dollars for a complete standard. In developing countries and others with limited resources this high cost restricts development of national standards, and Iceland for example, estimates that it cannot afford to produce more than 20 national standards in a year. Hence in five years, based on national effort alone, Iceland can expect to have produced no more than 100 standards compared with the several thousands required by a modern community.

These strong practical and financial incentives have resulted in more and more of the technical work of standardization being carried out internationally rather than nationally. The Director General of the British Standards Institution [4] stated their objective as :

"To do the job once
To do it right
To do it internationally."

In 1973, 66% of all standards projects in BSI were international. In the coming years this proportion of international work is expected to increase still further.

Although all standards may be regarded as means of communication it is those which govern methods of communication which form the main object of the present study. Standards of communication have existed in fact since the beginning of conscious life on earth. The ability to recognize and act upon, or reply to a signal implies an accepted common standard. Accepted common standards form the basis for all forms of information exchange. Warning signals are commonly used between animals and are immediately understood. On a higher level, human languages depend upon recognized standards of grammar and terminology. The quality of standards and their level of application governs the efficiency of information transfer, whether between individuals or systems; this is recognized on an international level in systems such as AGRIS and INIS and is why so much emphasis is placed on standardization in the UNISIST programme. From the start standardization was recognized as the basic means for providing the tools of systems interconnection [5]. But first should be considered why such interconnection is necessary.

The accelerating growth of scientific and technical literature and the task of placing this wealth of knowledge at the disposal of mankind has led to the establishment of information systems in many different fields. Because science and technology have become international there is an obvious need for exchange between national information systems in related fields. The growth of inter-disciplinary work brings the need also for information exchanges between systems operating in different subject fields. International systems, for example INIS and AGRIS, both operating in inter-disciplinary areas, have established guidelines for selecting, ordering and retrieving data. The experience gained from operating such systems and in developing the standards necessary for their operation is being applied in the development of the ISO system of International Standards.

In the review which follows the term "systems interconnection" has been treated in its broadest sense. This is in accord with the UNISIST approach; the UNISIST Working group on systems interconnection [6] identified eleven components of systems interconnection covering aspects of technical writing, primary and secondary publications, libraries and information centres, dissemination, evaluation and utilization of information. Standards have been developed in all these fields. They cover library science and documentation, terminology, data processing, reprography. Other standards defining symbols, quantities and units, even technical drawings are further essential aids to intercommunication.

The approach adopted by the UNISIST working group could be taken further and used to identify the interconnecting links required between the components, and hence the standards required for optimum interconnection. Some slight re-classification of the groups of components is convenient for this purpose :

Information producers	Primary	Authors, editors and publishers of primary journals.
	Secondary	Abstracting and indexing services. Producers of specialised bibliographies
Information distributors		Booktrade and subscription agencies Libraries Clearing-houses Information Centres Data banks Evaluation centres Referees or reviewers
Information users		

1.1 Standards governing communication within and between the main groups

These are the standards covering all aspects of general communication. They include :

- Standards governing vocabulary. Without an agreed terminology any form of communication is impossible and these standards contribute most of all to the quality of understanding, especially since many are published in a multi-lingual form.

Examples :

ISO 1382-1972	Rubber vocabulary
ISO/R 1087-1969	Vocabulary of terminology
ISO/DIS 2382	Data processing vocabulary

The production of such vocabularies is governed by a further basic set of standards established in the field of terminology by ISO/TC 37.

Examples :

ISO/R 919-1968	Guide for the preparation of classified vocabularies
ISO/R 1149-1968	Layout of multilingual classified vocabularies

- Standards governing units of measurement. As vocabulary is needed for verbal communication, so agreed quantities and units are needed for numerical communication.

Examples :

ISO 31/0 -1974	General principles concerning quantities, units and symbols
ISO 31/VI-1973	Quantities and units of light and related electromagnetic radiations
ISO 31/IX-1973	Quantities and units of atomic and nuclear physics
ISO/R 2014-1971	Writing of calendar dates in all-numeric form.

- Standards governing the use of public communication systems.

Examples :

ISO/R 216-1961	Trimmed sizes of writing paper and certain classes of printed matter
ISO/R 269-1962	Sizes of correspondence envelopes and pockets

The Telegraph Regulations, Telephone Regulations and Radio Regulations published by the International Telecommunication Union.

1.2 Standards governing communication between primary and secondary information producers

These are the standards which assist the relationship between author and editor, and which help the abstracting or indexing service, or the compiler of a bibliography to identify rapidly the subject matter of a primary publication and to present it in an appropriate form for others further along the "information chain."

Examples :

ISO 4-1972	Documentation - International code for the abbreviation of titles of periodicals
ISO/R 214-1961	Abstracts and synopses
ISO/R 215-1961	Presentation of contributions to periodicals
ISO/R 690-1968	Bibliographical references - Essential and supplementary elements

1.3 Standards governing communication between information producers and information distributors or users

These standards are designed to aid the identification of specific books, journals or other information carriers. They include numbering codes and also transliteration standards, which allow a title to be quoted in an alternative alphabet and which have the advantage of being reversible. (Transliteration must not be confused with transcription into another language, a procedure which may not be reversible).

Examples :

ISO 2108-1972	Documentation - International standard book numbering (ISBN)
ISO/DIS 3297	International standard serial numbering (ISSN)
ISO/R 233-1961	International system for the transliteration of Arabic characters

A further group of standards under this heading is designed to aid the intelligibility or acceptability of information. The group includes standards governing layout and design.

Examples :

ISO/R 8-1954	Layout of a periodical
ISO/R 30-1956	Bibliographical strip
ISO/R 999-1969	Index of a publication

1.4 Standards governing communication between information distributors and between distributor and user

Standards in this group include directories, formats and codes, standards governing information processing.

Examples :

ISO 2146-1974	Directories of libraries, information and documentation centres
ISO 2709-1973	Documentation - Formats for bibliographic information interchange on magnetic tape
ISO 646-1973	7-bit coded character sets for information processing interchange
ISO/R 1861-1971	7-track 8RP mm (200 RPI) magnetic tape for information interchange
ISO 2195-1972	Data interchange on rolled-up punched paper tape - General requirements
ISO 2711-1973	Information processing interchange - Representation of ordinal dates

1.5 Standards designed to aid the internal working of information distributors

Standards governing the work of libraries and information centres and designed to lead to compatibility between their systems.

Examples :

ISO/R 169-1960	Sizes of photocopies (on paper) readable without optical devices
ISO/R 446-1965	Microcopies - Legibility tests - Description of the ISO mire (ISO test object) and its use in photographic document reproduction
ISO 2145-1972	Numbering of divisions and subdivisions in written documents
ISO 623-1974	Paper and board - folders and files - sizes
ISO 838-1973	Paper - Holes for general filing purposes - Specification
ISO 2789-1974	International library statistics

1.6 General

It is clear that many of the standards quoted above would fit into more than one category, but by identifying the elements in systems interconnection and then the types of link within and between them it is possible to define the needs for standards. This could provide a systematic basis for planning of future programmes of standardization for systems interconnection.

2. THE MAKING OF STANDARDS

2.1 International standardization

The organized approach to national standardization through the formation of specialized standardization bodies did not begin until early in the twentieth century. The formation of international standardization organizations followed soon after but progress in this direction was halted by the second World War. In 1947 ISO was established as a result of a meeting of the United Nations Standards Co-ordinating Committee attended by delegates from 25 countries. To-day the national standardization bodies of 75 countries are represented in the membership of ISO.

The technical work of ISO is conducted by 146 technical committees with their sub-committees and working groups, a total of some 1 500 working bodies. The secretariats of the committees and their subsidiaries are held by individual ISO member bodies and this decentralized activity is co-ordinated by the ISO Central Secretariat in Geneva. This represents an extremely high level of technical activity estimated as involving the efforts of 100 000 experts engaged in about eight international meetings every working day.

As far as information transfer is concerned ISO plays a triple role :

- it is an international organization concerned with the development of standards designed to facilitate the management of scientific and technological information;

- it is concerned with the collection, generation and analysis of scientific and technical information and its presentation in a specialized form designed to be useful in practice;

- it constitutes a world-wide information network, an aspect which will be treated in more detail below.

In fulfilling the first and second of these roles account must be taken of social and economic as well as technical factors if the resulting standards are to be widely applied in practice. An International Standard must therefore be based upon an international study of the technical and economic aspects involved, linked to user considerations. It represents an advanced form of information analysis and presentation. An International Standard represents an agreement between the member bodies of ISO. The steps involved in the creation of an International Standard are outlined elsewhere [8,9].

ISO work is of interest to many other international organizations: some of these make a direct technical contribution to the preparation of ISO standards; others, particularly the intergovernmental organizations, contribute to the implementation of ISO standards, for example by utilizing them in the framework of intergovernmental agreements. ISO has adopted arrangements for associating these organizations closely with all stages of the work :

- international organizations may make proposals for the preparation of ISO standards in a new field in the same way as ISO member bodies;

- before the creation of a new technical committee or sub-committee, consultations are initiated with the main interested international organizations in order to seek their full support for the proposed programme;

- international organizations may be granted "liaison status" with ISO technical committees and sub-committees. Liaison status comprises two categories: "A" (effective contribution to the work) and "B" (wish to be kept informed only). Liaison A gives the right to attend meetings, submit papers and participate in discussion;

- in drawing up priorities in its programme of work an ISO technical committee is instructed to give special consideration to items suggested by intergovernmental organizations; target dates for the completion of work on certain items will be established if these organizations so request;

- international organizations which can make an effective contribution to the implementation of ISO standards are expressly invited to comment on all relevant drafts;

- technical committees are instructed to seek the full and, if possible, formal backing of the main international organizations in liaison for each ISO standard in which these organizations are interested.

- Some 300 international organizations have liaison status with ISO; this includes all UN specialized agencies working in similar fields. The work of ISO would be largely ineffective without this high level of co-operation extended by other international organizations.

International standardization activities in fields which have an obvious and direct bearing upon the collection, storage, retrieval, exchange and dissemination of information are controlled by 3 technical committees, their subsidiary 17 sub-committees and 14 working groups. This represents 34 panels of international experts, including also those from international organizations, who are working on standardizatio problems related to systems interconnection. The secretariats responsible for organizing this activity and other related work mentioned below are shared by the ISO member bodies from 16 countries.

The three technical committees of principal interest in systems interconnection are :

ISO/TC 37	Terminology (principles and co-ordination)
ISO/TC 46	Documentation
ISO/TC 97	Computers and information processing

The organization and basic terms of reference of these TC's are tabulated in Appendix 1.

There are a number of other ISO technical committees the work of which affects methods of presentation and communication of scientific and technological information, or systems interconnection in other fields. Among them the following should be mentioned :

ISO/TC 10	Technical drawings
ISO/TC 12	Quantities, units, symbols, conversion factors and tables
ISO/TC 68	Banking procedures
ISO/TC 95	Office machines
ISO/TC 130	Graphic technology
ISO/TC 154	Documents and data elements in administration, commerce and industry.

Brief information on these technical committees also is included in Appendix 2.

Attention will now be given in more detail to the three ISO technical committees of primary interest in systems interconnection. (Further details are given in the annual reports of these three technical committees) [10, 11, 12].

2.2 ISO/TC 37 -"Terminology (principles and co-ordination)"

In a document prepared for the UNISIST Working Group on Systems Interconnection, Felber [13], who is secretary of ISO/TC 37, showed how international work on terminology provides the infrastructure for all information and documentation activities. All the 146 ISO technical committees are concerned with terminology, each in its own field, and in most cases a special sub-committee or working group has been established with the task of preparing a vocabulary and of defining the systems of concepts required. This activity in itself represents a very large contribution to intelligible communication. The work of ISO/TC 12 in standardizing the units and symbols required within different fields of science and technology may be regarded as having a similar function where numerical values are concerned.

The need to co-ordinate terminological work on a world-wide basis led Unesco to support the establishment in 1971 of an International Information Centre for Terminology (INFOTERM) located with the ISO member body for Austria, Oesterreichisches Normungsinstitut, and closely linked with the secretariat of ISO/TC 37 This development has been described in detail by Wüster [14]; an important function of the centre is to collect and disseminate information on terminological publications from all over the world, in particular terminological standards. It will become an important instrument in securing the implementation and application of standards.

ISO/TC 37 is concerned with establishing standards for terminological work rather than with the actual production of vocabularies and terminologies. It has established liaisons with 41 international organizations as well as with a number of ISO and IEC technical committees concerned to apply standards developed by TC 37 to their own terminological work.

The programme of ISO/TC 37 includes the following items:

- Vocabulary of terminology
- Guide for the preparation of classified vocabularies
- Naming principles

- International unification of concepts and terms
- Layout of monolingual classified vocabularies
- Layout of multilingual classified vocabularies
- Symbols for languages
- Lexicographical symbols
- International colour code for languages.

2.3 ISO/TC 46 -"Documentation"

ISO/TC 46 has established liaisons with 27 international organizations. The work is shared by 3 sub-committees and 14 working groups. The programme of work includes the following items:

- International list of title word abbreviations
- Layout of periodicals
- Bibliographical references
- Bibliographical strip
- Presentation of contributions to periodicals
- Abstracts
- Transliteration of Arabic
- Conversion of Yiddish
- Transliteration of Hebrew
- Romanization of Japanese
- Library statistics
- Presentation of translations
- Patents, bibliographical references
- Vocabulary of information and documentation
- Transliteration of the alphabets of non-Slavic languages using Cyrillic characters
- Vocabulary for documentary reproduction
- Transparent A6 size microfiche
- International standard serial numbering (ISSN)
- Codes for the representation of names of countries
- Contents pages in periodicals and collected works
- Formats for bibliographic information interchange magnetic tape
- Bibliographic filing arrangements
- Guidelines for the establishment and development of thesauri
- Bibliographic entries for microfiche readers
- Microcopying of technical drawings
- International Standard Record Number (ISRN)
- Method for determining the resolution obtained in microcopying
- Method for determining and checking the quality of microcopies
- Scientific and technical reports, layout
- Technical manuals, contents
- Microcopying of newspapers

2.4 ISO/TC 97 -"Computers and information processing

ISO/TC 97 has established liaisons with 24 international organizations. It is organized into a main committee with 14 sub-committees. The project list is too long for reproduction here, but it may suffice to summarize the scopes of those sub-committees the work of which is of particular interest in systems interconnection :

SC 1 - Vocabulary :

The establishment of a vocabulary of data processing.

SC 2 - Character sets and coding :

The standardization of coded character sets, code extension, definitions of characters for representation by single and multiple bytes, and coded representations of characters recorded in media for the interchange of coded information between devices, equipments and systems.

SC 3 - Character and mark recognition :

The standardization of the shapes of characters and marks for input and output of data, for exchange among data processing systems and associated equipment using machine-legible characters or marks, and of the associated print quality requirements.

SC 5 - Programming languages :

The standardization of programming languages.

SC 6 - Data communications :

To define the system functions, procedures and parameters necessary for the transfer of data between data systems over communication networks. To effect liaison with CCITT and CCIR and to prepare proposals for their consideration and for inclusion in CCITT and CCIR Recommendations as appropriate. To prepare International Standards relating to those aspects of data communications for which ISO is responsible.

SC 7 - Documentation of computer based systems :

Standardization of the documentation that is used in association with a data processing system but which is not an integral part of the processing of data, including flowcharts and flowchart symbols and other techniques used in representing data processing problems and in representing their definition, analysis and method of solution.

SC 10 - Magnetic disks :

Standardization in the field of magnetic disks and the recording of digital data on them for the interchange of information and media among data processing systems and associated equipment.

SC 11 - Magnetic tape :

Standardization in the field of magnetic tape and the recording of digital data on it for the interchange of information and media among data processing systems and associated equipment.

SC 13 - Interconnection of equipment :

Standardization of input-output interfaces, but excluding data transmission modem interfaces.

SC 14 - Presentation of data elements :

- Standardization of the representations of data elements that are commonly interchanged among data processing systems and are not specific to particular user groups.

- Standardization of the representations of data elements that are commonly interchanged among data processing systems and require special treatment in automatic data processing.

- Standardization of procedures for describing interchange formats among data processing systems.

- Standardization of guidelines to assist ISO committees concerned with specialized applications in the representations of data elements to be interchanged among data processing systems.

SC 15 - Labelling and file structure :

Standardization of labelling and file structure for the interchange of data recorded on media.

2.5 Co-operation in standardization for systems interconnection

Some 10 ISO technical committees with their sub-committees and working groups are concerned with the preparation of International Standards of direct importance in systems interconnection. Many other ISO/TC's devote a part of their activities to standards of importance in this connection. In the making of standards liaison is maintained between ISO technical committees and with other international organizations. The technical committees are themselves composed of experts from many countries appointed by the ISO member bodies. It might be said that an ISO technical committee itself comprises a form of systems interconnection.

Co-operation, therefore starts in the committees appointed to draft standards. The extensive liaisons with other international organizations help to ensure compatibility at least in new developments. These organizations freely place at ISO's disposal the vast knowledge and experience gained in operating other systems. It is instructive to review the liaisons between ISO technical committees and the international organizations most closely concerned with organizing the Varna symposium.

FAO has established liaisons with 43 ISO technical committees (TC) and sub-committees (SC), including ISO/TC 37 - Terminology - and ISO/TC 46 - Documentation.

IAEA has liaisons with 14 ISO/TC's and SC's including ISO/TC 46 - Documentation - and two of its sub-committees which deal with "Conversion of written languages" and "Automation in documentation." Also IAEA has liaisons with ISO/TC 97 - Computers and information processing - and with three of its sub-committees which deal with "Vocabulary", "Character sets and coding" and "Representation of data elements."

Unesco is in liaison with 8 ISO/TC's and SC's including ISO/TC 37 - Terminology, ISO/TC 46 - Documentation - and its sub-committee dealing with "Documentary reproduction", and ISO/TC 97 - Computers and information processing.

WHO has liaisons with 44 ISO/TC's and SC's including ISO/TC 37 - Terminology - and three sub-committees of ISO/TC 97 dealing with "Vocabulary" "Programme language" and "Documentation of computer based systems."

It is interesting to note the differences in emphasis placed by these organizations in their relationships with ISO, particularly as all have a direct interest in the development and application of standards in systems interconnection. It should also be emphasized that liaison is a two-way process. For example ISO is co-operating as fully as possible in the UNISIST programme and has been represented at the meetings of committees and working groups on many occasions. The working programmes of ISO technical committees have been adapted to the requirements revealed by studies in connection with UNISIST.

3. STANDARDS ALREADY PUBLISHED OR UNDER DEVELOPMENT

International Standards developed by the ISO technical committees are listed elsewhere [15] and the scope of the activities of these committees have already been outlined. A selection of standards already published which should be applied in information centres [16] is reproduced here as Appendix 2. The following table gives a summary of the numbers of published International Standards and Draft International Standards so far prepared by the ISO technical committees principally concerned with information transfer activities. It also shows the numbers of draft proposals, a stage in which projects are still under discussion in the technical committees.

ISO INTERNATIONAL STANDARDS AND DRAFT INTERNATIONAL STANDARDS

Technical Committee	International Standards	Draft International stand.	Draft proposals
10 - Technical drawings	10	3	33
12 - Quantities, units, symbols	12	2	8
37 - Terminology	7	–	4
46 - Documentation	33	11	16
68 - Banking procedures	–	–	–
69 - Statistical methods	3	7	10
95 - Office machines	13	10	23
97 - Information processing	46	30	44
130 - Graphic technology	–	13	2
154 - Documents and data elements in administration, commerce and industry	–	–	–

Many national standards have been developed in these fields and a later paragraph, devoted to sources of information, will include further reference to these. Fortunately, many national standards governing aspects of systems interconnection are aligned with International Standards. According to Löhmann [17] this is not always the case; he writes :

"National standards may be useful as an experience or a first step to international standards, but they can also be obstructive. Thus the different national cataloging rules are a severe problem ...."

Systems interconnection is one area where the development of standards must take place on an international basis if the aims and objectives of the UNISIST programme, and those implied in the title of the Varna Symposium are to be realized.

4. IMPLEMENTATION OF STANDARDS

The subject of this paper "Application of standards in systems interconnection" has been interpreted broadly. The first step towards implementation of standards is to recognize the need. The second step is to develop the right standards. These aspects have already been discussed.

For many years standards-making bodies regarded the job as finished once a standard had been made and published. Since those bodies were formed by groups of people or organizations aware of their own need for standards perhaps this was sufficient in the early days. Now it is recognized that a national or international standards organization has a duty to the community at large. It is in everyone's interest that accepted standards shall be widely applied. It is equally important that the quality of the system of standards shall be as high as possible. As far as national standards affecting systems interconnection are concerned the question of quality must include compatibility with International Standards, existing or under development.

It is clearly in no-one's interest to develop a standard on some aspect of systems interconnection in ignorance of other standards existing in the field. It is equally useless to develop a standard if the potential user is subsequently unaware of its existence. To secure application of standards it is necessary to have an efficient organization for the distribution of those standards to the potential user and publicity to alert him to their existence. Linked to this is the need for information, interpretation and advice on the application of standards. The user too must play an active role in providing "feed-back" information from his experience in applying the standards.

4.1 Promotion of standards

All standards organizations have active sales departments, since often they rely upon sales of standards for a significant proportion of their income. Many publish periodical journals giving news and views about standards and standardization. These operations are of a general nature and something more is obviously needed in the field of systems interconnection.

The very existence of systems such as INIS, AGRIS and the UNISIST concept have helped to underline the need to apply accepted standards. Publications such as the UNISIST Newsletter [18] are valuable in helping to meet the need for specialized information. Conferences, meetings and symposia are valuable opportunities for reviewing the work and identifying present shortcomings and future needs.

The whole question of promotion and dissemination of standards warrants further study. In particular, there is a need to improve the availability of standards on systems interconnection, and the awareness of their existence, in the developing countries.

4.2 Sources of information

4.2.1 Catalogues and bibliographies

Most national standards organizations issue catalogues listing their published standards and, by an exchange scheme, each ISO member body receives a full set of these catalogues and of the national standards published by the other member bodies. This constitutes a source of reference material in each country where information is available on standards in all subject fields. In the USA, where standardization activities are very much decentralized, special measures have been taken to make the somewhat scattered information more readily available. The National Bureau of Standards has compiled a KWIC index of US standards [19,20] which includes many references to standards of interest in systems interconnection.

It has already been emphasized that systems interconnection now demands international standardization, and some national standards bodies include information in their catalogues indicating the correspondence between their own national standards and ISO International Standards. In the ISO Catalogue standards are listed by technical committee and so those governing systems interconnection may be identified quite readily by reference to the sections devoted to the technical committees in paragraph 3.

A further useful source of information on International Standards has been compiled in the USA, again in the form of a KWIC index [21]. It lists many standards dealing with documentation, data processing, terminology and other aspects of systems interconnection.

A bibliography of national and international standards in the field of documentation, terminology, data processing, classification and related subjects prepared by Prokop and Vanickova [22], covers an even wider field. Because of the clear classification system adopted this bibliography is useful even to those who cannot read the preface, written in Czech. The titles of the standards referred to are given in the original languages.

4.2.2 Special information centres and agencies

The existence of all these works of reference is useful to the librarian or information scientist who might be expected to be aware of them. But more is needed if standards are to be applied in time to prevent costly developments taking place independently and leading to incompatible systems. Steps have been taken in a number of directions in this respect and the establishment of INFOTERM has already been mentioned in an earlier paragraph.

Plans are now in hand to establish in collaboration with Unesco a second information centre responsible for the collection, storage, retrieval and dissemination of information on standards relating to documentation and information processing. This centre, which may be called ISODOC, will be closely linked

with the activities of ISO/TC 46 - Documentation. It will be expected to assume a critical role with regard to standards in its field, to identify gaps and shortcomings and to advise on the application of standards.

Other centres have been established with the support of Unesco as an aid to securing the implementation of standards. International Standard Book Numbering (ISBN) is the subject of International Standard ISO 2108-1972, and an international agency has been established at the following address to aid the implementation of this standard :

ISBN International Agency
Staatsbibliothek Preussischer
Kulturbesitz,
Postfach 1407
1 Berlin 30 / Germany

Similarly, draft International Standard 3297 deals with International Standard Serial Numbering (ISSN); an international centre for the registration of serial publications has been established by the French government and Unesco at the following address :

ISSN Agency
20 rue Bachaumont
75002 Paris / France

The agency has prepared a clear and concise guide [23] to the International Serials Data System (ISDS)

In the development of a thesaurus for information storage and retrieval a first step recommended in International Standard ISO 2788 is to investigate whether thesauri already exist in the subject field or related fields. Centres have been established to register details of existing thesauri and work in progress, and to give information about them.

For English language thesauri :

Bibliographic Systems Center
School for Library Science
Case Western Reserve University
Cleveland
Ohio 44106 / USA

For thesauri in other languages :

Centralny Institut Informacji
Techniczinej i Economiecznej (CIINTE)
Clearing House Al
Niepodlegosci 188
Warsaw / Poland

4.2.3 The ISO Information Network

Many national standardization organizations have efficient technical information units and an international information centre was established in 1970 at the ISO Central Secretariat in Geneva to meet the the needs of the international organizations for information on standardization. The reason for the Varna Symposium is the recognition that no information system is self-sufficient. Hence even the largest standards information centres have a need for information from others. Well planned systems of information, drawing upon international sources are even more essential to developing countries and they must be planned to be compatible with international standards. ISO has already taken a number of measures to help developing countries to build adequate standardization systems through special membership arrangements and the formation of development committees linking ISO with IEC, Unesco, UNIDO and other organizations interested in the promotion of standardization in the developing countries.

The ISO Information Network was recently established to ensure the rapid and efficient interchange of information between standards information centres throughout the world. It will help to raise levels of efficiency in these centres and to ensure that international standards are applied in their operation. It will constitute a world-wide information network linking national scientific and technological systems through the ISO member bodies and internationally to the other major information systems through the ISO Central Secretariat. An outline plan for the development of the ISO Information Network is included here as Appendix 3. The importance attached internationally to this development is clear from its inclusion amongst the measures to be supported by Unesco in solution of one of the 12 major world problems identified by them — Exchange of information — in a review undertaken as a basis for future planning [24].

There is a need for advice and guidance on the application of standards to particular problems, no less in the field of systems interconnection than in other areas. An information need is seldom fully satisfied by lists of documentary references. Even when provided with the actual documents the user often faces a formidable task. He must secure translations of those written in foreign languages and he must

select and analyse the technical content and apply the result to his problem. For the user the perfect answer lies in an analysis of the contents of the documents underlining the significance to him. This implies the technique of the information analysis centre in which documentalists, information scientists and subject specialists work as a team.

Obviously such centres must be located at the focus of expertise in the subject field. A start has been made with the creation of INFOTERM, located with the secretariat of ISO/TC 37 -"Terminology" and with the plans to create ISODOC referred to above. But, to be effective such centres must not merely be compilers of bibliographies, or referral centres. They must anticipate the need for critical reviews and analyses, and they must respond to demands for assistance, particularly from the developing world.

Hence, in the future, information on standards affecting systems interconnection will be available on a world wide basis through the ISO Information Network. In each country access to the network will be through the national organization for standardization. For international organizations, access will be through the ISO Information Centre in Geneva. Special advisory and consultative facilities will be provided by specialized centres linked to the network. Details have yet to be established but, as stated above, Unesco has offered support for the feasibility study outlined in Appendix 3.

4.2.4 Information on standards-making bodies

The whole field of data processing standards has been reviewed by Hill [25], who lists a number of organizations working in the field with details of their structure and working methods.

To identify the international organizations interested in standardization in the various subject fields associated with systems interconnection it is probably sufficient to scan the lists of liaisons noted in the annual reports of the ISO technical committees. But much information remains to be gathered together on the standardization activities of the international organizations, and this is a priority task of the ISO Information Centre in Geneva. It would indeed be a disaster if several incompatible systems of international standards were to develop. The position of ISO as the recognized international agency for standardization makes this unlikely, especially having regard to the close and friendly links which exist between ISO and the other international organizations working in technical fields associated with systems interconnection.

5. CONCLUSIONS AND RECOMMENDATIONS

Five vital steps towards the implementation of standards in systems interconnection have been outlined above. They are :

Recognition of the need
Preparation of the standards
Promotion and distribution
Information, interpretation and advice
Feed-back from the user.

5.1 A planned approach to the recognition of the need for new standards should be based upon the identification of the components of systems interconnection and a study of the interconnecting links required between them. The components include information producers (primary and secondary), information distributors and information users.

5.2 Preparation of the standards must be international and channelled through ISO (or through ITU in the case of telecommunications). A high level of co-operation must be maintained by ISO with other organizations. This will avoid the development of conflicting standards.

Feed-back from the user must be regarded as a vital element in the revision of existing standards. Such revision should take place at not less than five-yearly intervals. The testing of standards is a related aspect also requiring co-operation from the user.

5.3 A further study is needed on methods of promoting and distributing standards governing systems interconnection. In this study special attention should be given to the problems of developing countries.

5.4 Special international information centres and agencies are being established to give information on standards concerned with particular aspects of systems interconnection. Such centres must not play a purely passive role, but must analyse, interpret, advise and recommend on standardization programmes and on the application of standards in particular cases.

5.5 The development of the ISO Information Network, with potential access points in more than 70 countries is an urgent need. The Network will link the specialized centres, through national standardization bodies, to the scientific and technological information systems in those countries. The planned feasibility study should be prosecuted with all speed.

5.6 Implementation of standards in systems interconnection depends upon co-operation in all the five aspects identified above. In each case further study is needed and it is recommended that a meeting of those international organizations concerned with such developments should be planned to establish the basis for future progress. Such a meeting could be convened by ISO in the near future.

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LIST OF ISO TC's OF PRIMARY INTEREST IN SYSTEMS INTERCONNECTION

Organization, basic terms of reference and member body responsible for the Secretariat of ISO TC's, SC's and WGs responsible for standardization in fields of interest in connection with systems interconnection.

1. TC's OF PRIMARY INTEREST

TC 37	Terminology (Principles and Co-ordination)	ON (Austria)
	Standardization of methods of setting up and co-ordinating national and international standardized terminologies.	
TC 46	Documentation	DNA (Germany)
	Standardization in the field of documentation, libraries and related information handling, including information systems and interchange networks as applied to documentation.	
WG 1	Numbering systems in documentation	BSI (United-Kingdom)
WG 2	Representation and coding of country names	DNA (Germany)
WG 3	Terminology of documentation	DNA (Germany)
WG 5	Guide lines for the establishment of thesauri	DNA (Germany)
WG 6	Bibliographical and similar tasks	SCC (Canada)
WG 7	Presentation of publications	AFNOR (France)
SC 1	Documentary reproduction	AFNOR (France)
WG 1	Microfiches	ANSI (USA)
WG 2	Microcopying of technical drawings	BSI (United-Kingdom)
WG 3	Microcopying newspapers	SABS (South-Africa)
WG 4	Quality of microcopies	AFNOR (France)
WG 5	Vocabulary	AFNOR (France)
SC 2	Conversion of written languages	ANSI (USA)
SC 4	Automation in documentation	SIS (Sweden)
WG 1	Character sets for documentation and bibliographic use	ANSI (USA)
WG 2	Bibliographic content designators for machine processing	BSI (United-Kingdom)
WG 3	Bibliographic filing arrangements	NNI (Netherlands)
TC 97	Computers and Information Processing	ANSI (USA)
	Standardization in the area of computers and associated information processing systems and peripheral equipment, devices and media relating thereto.	
SC 1	Vocabulary	AFNOR (France)
SC 2	Character sets and coding	AFNOR (France)
SC 3	Character and mark recognition	SNV (Switzerland)
SC 5	Programming language	ANSI (USA)
SC 6	Data communications	ANSI (USA)

SC 7	Documentation of computer-based systems	SIS (Sweden)
SC 8	Numerical control of machines	AFNOR (France)
SC 9	Programming languages for numerical control	BSI (United-Kingdom)
SC 10	Magnetic discs	DNA (Germany)
SC 11	Computer magnetic tape	ANSI (USA)
SC 12	Instrumentation magnetic tape	ANSI (USA)
SC 13	Interconnection of equipment	DNA (Germany)
SC 14	Representation of data elements	ANSI (USA)
SC 15	Labelling and file structure	BSI (United-Kingdom)

2. SOME OTHER TC's WORKING IN FIELDS AFFECTING INFORMATION TRANSFER
(for further details of SC's and WG's see ISO Memento)

TC 10	Technical Drawings	SNV (Switzerland)
	Standardization and coordination of all kinds of technical drawings for engineering purposes (including architecture) to facilitate their preparation, reproduction, exchange and use; the coordination and, where appropriate, the establishment of graphical symbols for use on such drawings.	
TC 12	Quantities, Units, Symbols, Conversion Factors and Conversion Tables	DS (Denmark)
	Standardization of units and symbols for quantities and units (and mathematical symbols) used within the different fields of science and technology, giving, where necessary, definitions of these quantities and units. Standard conversion factors between the various units and conversion tables based on these factors.	
TC 68	Banking Procedures	ANSI (USA)
	Standardization in the field of international banking.	
TC 69	Applications of Statistical Methods	AFNOR (France)
	Standardization of statistical terminology and symbols, of presentation and formal interpretation of test and inspection results. Standardization of conditions of application of statistical methods used in specification and inspection of industrial and agricultural products and of processes which generate the products : application to the determination of characteristics and tolerances, sampling methods, choice of test methods and establishment of their repeatability and reproducibility. Besides, Technical Committee ISO/TC 69 has been entrusted, by the ISO Council, with the function of advisor to all ISO technical committees in matters concerning the application of statistical methods in standardization (Resolution 12 - Council 1959 and Resolution 26 - Council 1961).	

TC 95	Office Machines	UNI (Italy)

Standardization on terminology and definitions of functions of office machines, and of other fundamental elements of interest to users and manufacturers of such machines.

TC 130	Graphic Technology	AFNOR (France)

Standardization of terminology, test methods and specifications in the field of printing and graphic technology from the original provided to finished products.

The scope includes in particular :

- composition
- reproduction
- printing processes
- finishing (for example binding)
- suitability of inks, substrates and other materials used in graphic technology.

TC 154	Documents and Data Elements in Administration, Commerce and Industry	SIS (Sweden)

Standardization of documents and representation of data used for information interchange within administration, commerce and industry.

ISO INTERNATIONAL STANDARDS FOR APPLICATION IN STANDARDS INFORMATION CENTRES

1. LIBRARY SCIENCE AND DOCUMENTATION

ISO	4-1972	Documentation - International code for the abbreviation of titles of periodicals
ISO/R	8-1954	Layout of periodicals
ISO/R	9-1968	International system for the transliteration of slavic cyrillic characters, second Edition
ISO/R	18-1955	Short contents list of periodicals or other documents
ISO/R	30-1956	Bibliographical strip
ISO/R	77-1958	Bibliographical references - Essential elements
ISO/R	214-1961	Abstracts and synopses
ISO/R	215-1961	Presentation of contributions to periodicals
ISO/R	233-1961	International system for the transliteration of Arabic characters
ISO/R	259-1962	Transliteration of Hebrew
ISO/R	690-1968	Bibliographical references - Essential and supplementary elements
ISO/R	832-1968	Abbreviations of typical words in bibliographical references
ISO/R	833-1968	Abbreviations of generic names in titles of periodicals
ISO/R	843-1968	International system for the transliteration of Greek characters into Latin characters
ISO/R	999-1969	Index of a publication
ISO/R	1086-1969	Title-leaves of a book
ISO	2108-1972	Documentation - International standard book numbering (ISBN)
ISO	2145-1972	Numbering of divisions and subdivisions in written documents
ISO	2146-1972	Directories of libraries, information and documentation centres
ISO	2709-1973	Documentation - Formats for bibliographic information interchange on magnetic tape
ISO	2789-1974	International library statistics

2. TERMINOLOGY

ISO/R	639-1967	Symbols for languages, countries and authorities
ISO/R	704-1968	Naming principles
ISO/R	860-1968	International unification of concepts and terms

ISO/R	919-1968	Guide for the preparation of classified vocabularies (Example of method)
ISO/R	1087-1969	Vocabulary of terminology
ISO/R	1149-1969	Layout of multilingual classified vocabularies
ISO	1951-1973	Lexicographical symbols particularly for use in classified defining vocabularies

3. DATA PROCESSING

ISO	646-1973	7-bit-coded character sets for information processing interchange
ISO/R	1001-1969	Magnetic tape labelling and file structure for information interchange
ISO	1028-1973	Information processing - Flowchart symbols
ISO	2022-1973	Code extension techniques for use with the ISO 7-bit-coded character set

4. REPROGRAPHY

ISO/R	169-1960	Sizes of photocopies (on paper) readable without optical devices
ISO/R	193-1961	Microcopies on transparent bases - sizes of recommended bases
ISO/R	218-1961	Microcopies - Scale of 35 mm microfilms for international exchange
ISO/R	260-1962	Terms relating to microcopies and their bases
ISO/R	371-1964	Terms relating to microcopy apparatus
ISO/R	435-1965	ISO conventional typographical character for legibility tests (ISO character)
ISO/R	446-1965	Microcopies - Legibility tests - Description of the ISO mire (ISO test object) and its use in photographic document reproduction
ISO/R	452-1965	Essential characteristics of 35 mm microfilm reading apparatus
ISO/R	689-1968	Microcopies - Legibility tests - Description and use of the ISO micromire (ISO micro test object) for checking a reading apparatus
ISO/R	782-1968	Microcopy - Measurement of the screen luminance of microfilm readers
ISO/R	1116-1969	35 mm and 16 mm microfilms, spools and reels
ISO	2707-1973	Transparent A6 size microfiche of uniform division - Image arrangements No. 1. and No. 2
ISO	2708-1973	Transparent A6 size microfiche of variable division - Image arrangements A and B

AN ISO INFORMATION NETWORK - PLAN FOR A FEASIBILITY STUDY

0. PURPOSE

The development of an ISO Information Network is of intrinsic value to the UNISIST programme. A preliminary feasibility study would establish the pattern for this and possibly other similar developments in related fields, and this too is of interest in the context of the UNISIST programme. The purpose of the study is therefore to produce specific proposals for services, organization and operating procedures for an international information network on standardization.

1. INFORMATION FOR THE STUDY

1.1 Basic information

Identification of sources of information needed for the study :

- the literature, including INFCO and UNISIST documentation,
- persons or organizations with relevant knowledge and experience, e.g. ASLIB, FAO, IAEA etc.

1.2 Present position

- Current methods of providing information on standardization including the activities of international, regional and national standardization organizations.
- Assessment of present level of collaboration between these organizations.
- Types of service provided, types of user and (for enquiry services) types of question or request.

1.3 Potential

Standardization information needs of international information networks, international organizations, governments, science and industry, schools and universities, consumers, developing countries and others.

1.4 International information networks

Existing international information networks, their purpose, methods, achievements and shortcomings so far as they affect the present study.

2. PURPOSE OF THE INFORMATION NETWORK

The primary and subsidiary objectives of an ISO Information Network.

3. SCOPE

3.1 Subject coverage

Consideration of the possible subject coverage, including :

- information on standards,
- literature on standardization,
- regulations and legislation,
- terminology,
- classification and coding,
- reference materials,
- other types of information.

3.2 Activities and services

Possible activities and services to be based upon, or aided by the ISO Information Network, including :

- the exchange of standards information between centres,
- the operation of enquiry services,
- library services,
- selective dissemination of information (SDI),
- translations,
- abstracts,

- special listings and indexes,
- analytical reports,
- cumulations,
- data banks incorporating information from standards,
- the exchange of knowledge and experience in standards information work through seminars,
- exchange of personnel,
- education and training of the user,
- special news sheets or bulletins,
- testing of standards on documentation and information.

4. CONSTITUTION

4.1 Membership

The basis of membership of the ISO Information Network. The status of international, regional and national standardization organizations and of non-ISO members.

4.2 Members' relationships with the network

Mutual and special obligations, rights and responsibilities of members of the network.
Spheres of activity of the various types of member.
The right to accept a commitment for the network (e.g. contract).

4.3 Access to the network

Who may use the network and how access may be gained to it by the various classes of user.
The case for free services, services by subscription, service under contract.

4.4 Management of the network

Centralized and decentralized activities,
The part to be played by : ISO Council, INFCO, ISO Central Secretariat, Technical Committees and others.

5. LINKS AND COMMUNICATIONS

Types of communication required, bearing in mind the needs of human operators and of manual as well as mechanized systems,including :

- Interchange of information through bulletins, newsletters, the exchange of documents, films, micro forms, tapes, cards, abstracts etc.

- Standardization of media for the exchange of information, such as standards catalogues, interchange formats, enquiry forms etc.

- Links with other networks.

- Personal contact through visits, seminars, staff exchanges, regional groupings.

- Public communications systems : post, telex, telephone.

6. FINANCIAL ASPECTS

Consideration of financial aspects, including :

- setting up costs,
- running costs,
- participation of TC's and others,
- income from services rendered (pricing policies)

7. RECOMMENDATIONS

Recommendations resulting from the study should include an outline plan for the development of the ISO Information Network including stages in the development with an appraisal of the time, resources and further special studies required for their implementation.